A computerized CMHC clinical and management information system: Saga of a "mini" success

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A description is provided on the design and development of a comprehensive CMHC clinical and management information system incorporating state-of-the-art minicomputer technology.

In late 1976, the Ravenswood Hospital Community Mental Health Center (CMHC) undertook a study designed to determine the best way of meeting its anticipated information system needs for the future. At the time of the study, the CMHC's financial data processing needs (payroll, billing, budgeting, etc.) were being met by the hospital's Honeywell 6400 batch processing system. Some electronic data processing was available for statistical reporting through the State of Illinois mental health reporting system. The CMHC, as a condition of state funding, was required to submit monthly case opening and closing data, as well as daily logs accounting for staff time. These data were optically scanned and processed to yield a relatively comprehensive set of monthly statistical reports. While the contents of these reports were good, the 6- to 8-week turnaround time negated the utility of using them for effective program management. Manual, redundant systems had been developed haphazardly over the years at the CMHC to meet internal statistical reporting needs in a timely, although inefficient and incomplete, manner. In effect, the center was operating three independent information systems, the sum of which was not capable of meeting its information needs at the time in a cost-efficient manner.

Furthermore, we were aware that our problems with information were going to increase, given the then recent passage of PL 94-63, which harbingered the onset of the era of accountability for CMHCs. Pressures were mounting from third-party payers for increased documentation as a basis for substantiating charges. In addition, the development of standards for accreditation was in its infancy at this time, with every indication that when adulthood was finally achieved there would be a heavy additional information-handling burden placed on CMHCs as part of the center's rite of passage to accreditation. These external factors were actually overshadowed by internal demands for new and better

information by the then new executive director of the CMHC, who was (and remains) an advocate of data as a basis for decision making throughout all levels of the organization.

This same study included an exploration of alternative solutions. The need was obvious: a comprehensive, integrated, automated system. The only dilemma was how to achieve this goal. The alternative of developing software to be used on the hospital's main frame was rejected, for it was projected that the Honeywell system would continue with batch processing (as opposed to an on-line, interactive mode) for at least the next 5 years. There appeared to be no point in developing applications programs to be run in a batch mode. Furthermore, the center could not get a commitment from the EDP department that the CMHC's needs would have priority sufficiently high to enable it to have its data processing needs met even if the applications software were available. We also explored other timesharing systems, such as the MSIS (Laska, 1972), service bureaus, and so on, and rejected timesharing arrangements for reasons of (1) relatively high operating expenses, (2) inability to customize the system, (3) potential problems with data confidentiality, and (4) concerns about a lack of our ability to control external systems.

The most attractive alternative appeared to be the acquisition of a minicomputer system and applications software designed to meet our needs. The principal drawback appeared to be the risk to which we would be exposing ourselves in investing in hardware that might never be able to meet requirements. We also did not want service problems resulting from having separate hardware and software vendors. Furthermore, we did not want to underwrite all software development. Given these constraints, we explored the minicomputer market and found a vendor of turnkey systems: Qantel. A turnkey arrangement is one in which the responsibility for hardware and software is assumed by a single vendor, with no financial liability to the user until an operational system is delivered. Furthermore, the vendor was willing to share in the cost of developing the software in return for the right to future marketing royalties. A decision

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was made to begin development of a stand-alone, integrated, comprehensive, clinical and management information system for use in CMHCs.

This paper provides a description of the system goals, the design process, and the content and capabilities of the Ravenswood minicomputer system. This system has achieved a reputation as a model for CMHC computer systems.

SYSTEM GOALS

The design of the system was heavily influenced by the following considerations/constraints.

The system should have a demonstrable payoff to all levels of the organization. While everyone would agree that the system must supply management with information, we also maintained that there must be useful "information payoffs" (reinforcements) to clinical line and clerical staffs. After all, the clinical and clerical staffs have the major responsibility for capturing the data that the system would require to remain functional.

Since people at all levels of the organization have to make decisions, the system should support decision making at all levels. This notion, while appearing to overlap with the first consideration, differs from it in that we view all staff as managers. This self-management concept recognizes everyone as a controller of resources, even if a person's only resource is his or her own time. Information should be provided to support decisions on how to allocate these resources in the most cost-effective manner.

The system should be comprehensive and integrated. A comprehensive, integrated CMHC information system should be able to easily merge clinical data on client characteristics and treatment processes with treatment outcome data and fiscal data on the cost of providing care (Carter & Newman, 1976).

In order to insure longevity and marketability, the system should be easily modifiable. While we recognized that we would always want to know who referred a client to us, we also recognized that we might need to change how we classify the categories of referral sources. Such changes should not require reprogramming. Furthermore, in attempting to design a generic system that could be transported easily to another agency, we assumed that there would be significant commonality in the types of information needed, but little agreement as to categorical classification systems. A constraint, therefore, was to have the categorical classification systems as tables that exist independently of the applications programs. An additional constraint was to have tables within each of these tables in order to be able to use different definitions to meet different external reporting requirements. Consider a table (dictionary) of referral source categorizations including the elements of self, police, court, probation officers, other mental health centers, and so on. It is frequently the case that a center finds it useful to discriminate among the

courts, the police, and a probation officer, but the state definition does not differentiate them and combines them with the Department of Children and Family Services. Federal reports are based on yet another set of definitions. The system should be able to carry multiple classification tables within a table of referral sources in order to easily handle different sets of definitions for different reporting requirements.

The system must have an on-line capability to update files and to edit to minimize errors. Operators should have immediate feedback about an error; they should not be able to go past the point at which a major error occurs.

Clinicians' responsibilities for coding should be minimized whenever possible. Coding should be a clerical task that is facilitated by the computer.

The precise, mechanistic, numerical world of computers conflicts with clinicians' humanistic values. Therefore, we should design for peaceful coexistence.

The computer's greatest future application will be in the area of quality assurance. This CMHC will define quality assurance as the procedures used to determine whether the appropriate decisions are being made on behalf of clients. In order to audit these decisions, we must know what information was available and pertinent at the point at which a decision was made. The background data must be a part of the data base along with the decision, in order to automate aspects of the quality assurance program.

The CMHC's system should be able to communicate in some mode with the state's computer system and with the hospital's computer system.

The system should be extremely responsive to requests for new reports based on data in its files. A report generator should be available in addition to formatted (programmed) reports. There should also be a package of statistical subroutines that can be easily applied to the system's data.

Clinicians should be able to do data entry and retrieval in an on-line, real-time mode. If sufficient input/output devices (CRTs) are obtained, there is no need for forms. Furthermore, the system should be able at retrieval to "decode" any coded material to maximize clinicians' desire to use the system for information retrieval on their individual cases.

The system should contain all data present in the medical record except progress notes. It should be able to regenerate a chart should a chart be lost.

The system should minimize the need to recapture and input data it already has on file.

THE DESIGN PROCESS

The first step in the design process was to revamp the medical record. The quality assurance committee, charged with this responsibility, was composed of the directors and assistant directors of each of the center's programs, plus the clinical director and the assistant

came after an attempt to complete a retrospective chart audit (Hagedorn, Beck, Neubert, & Werlin, 1976) wherein each member of this committee had to search

**RAVENSWOOD HOSPITAL MEDICAL CENTER
COMMUNITY MENTAL HEALTH CENTER
TIME OF FIRST TREATMENT**

CLIENT'S NAME: LAST _____ FIRST _____ INITIAL _____ I.D. # _____

APPOINTMENT FOR FIRST SESSION: DATE / /

THERAPISTS NAME: _____ I.D. # _____

AVAILABLE CLIENT RESOURCES

☐ FAMILY SUPPORT	☐ ARTICULATE
☐ SUPPORT FROM SIGNIF. OTHERS	☐ GOOD JUDGEMENT
☐ STRONG RELIGIOUS AFFILIATIONS	☐ RAPPORT WITH THERAPIST
☐ THERAPY-WISE	☐ INSIGHTFUL
☐ MOTIVATED	☐ RELATES OPENLY
☐ ATTITUDE ABOUT MENTAL ILLNESS	☐ RELIABLE AND RESPONSIVE
☐ HEALTH INSURANCE/MONEY	☐ ACCURATELY PERCEIVES & ACKNOWLEDGES PROBLEM
☐ CONCERNED FAMILY PHYSICIAN	☐ WILLING AND CAPABLE OF CHANGE
☐ INTELLIGENT	☐ OTHER _____
☐ WELL EDUCATED	☐ OTHER _____
☐ OTHER AGENCIES INVOLVED IN TREATMENT	☐ OTHER _____
☐ INTERESTS (MUSIC/DANCING, ETC.)	

PROBLEM LIST

SEVERITY SCALE

1. VERY MILD (VERY SELDOM) 4. SEVERE (FREQUENT)
2. MILD (SELDOM) 5. VERY SEVERE (VERY
3. MODERATE (OCCASIONALLY) FREQUENT)

[illegible]

LEVEL OF FUNCTIONING_____

DSM DIAGNOSIS NAME

CODE # _____

SUICIDE (✓)
POTENTIAL

_____ EXTREME
 _____ MODERATE
 _____ MINIMAL
 _____ NONE

POTENTIAL
DANGER TO
OTHERS (✓)

☐ EXTREME
☐ MODERATE
☐ MINIMAL
☐ NONE

PARS SCORES AT INTAKE: / / FILLED OUT

SCL-90 SCORES AT INTAKE: / / OBTAINED

Figure 1. Time of first treatment input document.

five charts to determine whether certain agreed upon standards of care were in evidence. Only one such random search experience was necessary to convince committee members of the need for a more standardized format for charts. Training sessions were then held to point out the pros and cons of a problem-oriented record (POR). The POR concept (Ryback, 1964) was quickly adopted as the format for the new record. The quality assurance committee then split into two task forces: one to work on the data base and the other to develop a problem list and a treatment plan format. Clinical line staff were selected to join the task forces in order to assure them adequate opportunity for input.

Data Base

The data base task force had the charge of redesigning all documents in the chart, with the exception of the treatment plans (which were absent entirely in the old charts) and the progress note format. A previous task force at the CMHC had taken the draft of mental health-related definitions (Baxter, 1980) and had modified it item by item to produce a set of locally agreed upon CMHC definitions. While it is tempting to avoid the quarreling endemic in such a task by rationalizing that everyone knows what is meant by "a client," "a staff hour," "an indirect service," and so on, our experience indicates (just by the extent of the debates) that this process is mandatory. The absence of agreed upon definitions is a good way to sabotage any information system by guaranteeing outputs that are uninterpretable.

The data base committee was first asked to trace (flowchart) the path of a client through a hypothetical CMHC similar to our own (a ploy useful for stimulating creative thinking), with the idea of identifying the key decision points in the system. The key stages identified included (1) initial contact, (2) evaluation, (3) treatment planning, (4) treatment review, and (5) termination. Initial attempts to delineate the decisions made at each of these points were not particularly successful. Things improved dramatically when we finally managed to stumble upon the right question: "What are/should be the choices available to you and your clients at each of these stages?"

The next step in designing the data base of the POR was to ask what information (data) would be/should be useful to have in order to make each of these decisions? Responses to this question were slow. At this point, we brought in lists (Newman, Note 1) of examples of information that other agencies were collecting in their data bases and asked committee members to decide on the following for each variable: (1) What purpose (decision) would it serve to know this? (2) Do you think it is important enough to be included in our data base? (3) When should we capture it (for what decision is it needed)? (4) Who should capture it? Several iterations of this process yielded the clinical data base, which was then merged with the data needed to meet external reporting requirements to yield the complete data base.

It should be noted that by asking staff, in effect, what information should impact a particular decision, we were designing a data base that was interventionally relevant (Johnson, Giannetti, & Williams, 1976). That is, in the process of completing forms, staff members are forced to consider (or at least be exposed to) data they might not normally incorporate into their decision making. For example, by including recent stresses, problem durations, and so on, the center has at least assured that clinicians are exposed to such information (e.g., see Figure 1).

The data base committee's final products were the "approved" form layouts and a set of manuals describing how the forms were to be filled out.

Problem List

The development of the problem list followed the general procedure outlined for the data base. Committee members received training on the purpose the problem list was to serve. The philosophy adopted was that the problem list was to be as descriptive as possible. The focus was to be on issues that clients presented. Therapists' construct systems were (painfully) excluded. It was often necessary to point out to staff that clients did not present "repression" as the reason for requesting services. Examples of problem lists used in other agencies (see Ryback, 1974) were culled and submitted to a subjective content-analysis procedure to yield the final problem list. The "finished" version is dynamic, in that new problems are added to the glossary when omissions are discovered. The most troublesome issues had to do with classifying family problems. The not entirely satisfactory resolution was to incorporate a family problem list into the final glossary (see Figures 2 and 3).

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- A AGGRESSION
 - B SUICIDE / SELF-DESTRUCTION
 - C PRODUCTIVITY SELF-MANAGEMENT
 - D EDUCATION
 - E INTERPERSONAL & SOCIAL ACTIV
 - F MARITAL / COUPLES PROBLEMS
 - G SEXUAL FUNCTIONING
 - H FINANCIAL/LEGAL
 - I ALCOHOL
 - J DRUG AND SUBSTANCE ABUSE
 - K AFFECTIVE FUNCTIONING
 - L PHYSICAL-MEDICAL
 - M SELF-CONCEPT/SELF-ESTEEM
 - N PERCEPTUAL-COGNITIVE FUNCTNG
 - O SELF-CONTROL
 - P PROBS INTERFERING WITH TX
 - Q OTHER
 - R FAM VERBAL COMMUNICATION PROB
 - S FAM AFFECTIVE FUNCTIONING PROB
 - T FAM PROB SOLV.PLANNING,ORGNZTN
 - U FAM CONTROL PROBLEMS
 - V FAM COHESION PROBLEMS
 - W EXTRA/FAMILIAL PROBLEMS
 - X FAM PROBS RE: STRESS & LOSS
-

Figure 2. General problem area glossary.

H108	OTHER
H200	LEGAL PROBLEMS
H201	CIVIL
H202	CRIMINAL
H203	NEEDS LEGAL ASSISTANCE
I000	*****ALCOHOL ABUSE*****
I001	EXCESSIVE ALCOHOL INTAKE
I002	INTOXICATED NOW
I003	D.T.S.
I004	BENDERS
I005	BLACKOUTS DUE TO ALCOHOLISM
I006	ABSENTEEISM DUE TO ALCOHOLISM
I007	JOB LOSS DUE TO ALCOHOLISM
I008	ARRESTS DUE TO ALCOHOLISM
I009	FAM. PROBS DUE TO DRINKING
I010	OTHER PROBS DUE/ALCOHOL ABUSE
J000	***DRUG AND SUBSTANCE ABUSE***
J001	DRUG ABUSE
J002	SUBSTANCE ABUSE
K000	***DISTURB. IN AFFECTIVE FUNC.*
K001	AFFECT BLUNTED OR UNVARYING
K002	INCREASED LABILITY OF AFFECT
K003	AFFECT INAPP. TO THOUGHT CONT.
K004	ANXIETY ATTACKS
K005	APPREHENSIVE BEHAVIOR
K006	PHOBIAS
K007	DIFF VERB. EXPRESSING FEELINGS
K008	UNCONTROLLABLE LAUGHING/GIGGLE
K009	DEPRESSIVE FEELING
K010	EASILY ANGERED
K011	OTHER DIST. IN AFFECT. FUNCT.
L000	*****PHYSICAL & MEDICAL *****
LA00	EATING
LA01	ANOREXIA
LA02	FOOD REFUSAL
LA03	OVEREATING
LA04	FOOD RITUALS
LA05	OBESITY
LA06	DIET PROBLEMS (UNUSUAL CONTENT)
LA07	OTHER EATING DIFFICULTIES
LB00	SLEEPING
LB01	BEDTIME RITUALS
LB02	CHRONIC RESISTANCE TO SLEEP
LB03	DIFFICULTY IN FALLING ASLEEP
LB04	EXCESSIVE SLEEPINESS
LB05	FITFUL SLEEP
LB06	HYPERSOMNIA
LB07	HYPOSOMNIA
LB08	NIGHT FEARS
LB09	NIGHT TERRORS
LB10	NIGHTMARES
LB11	SOMNAMBULISM
LB12	TALKING IN SLEEP
LB13	UNWILLINGNESS TO SLEEP ALONE
LB14	OTHER SLEEPING DIFFICULTIES
LC00	BOWEL AND BLADDER FUNCTIONS
LC01	RESISTANCE TO TRAINING
LC02	NOT TOILET TRAINED

Figure 3. Problem area descriptions.

Treatment Plan

A decision was made to design a problem and goal-oriented treatment plan. Our treatment plan thus incorporated a form of goal attainment scaling (GAS) (Kiresuk, Davis, & Lund, 1980; Kiresuk & Sherman, 1968). The goals of treatment are to be negotiated with

the client using the GAS as a vehicle for negotiation. Clinical staff members are asked to provide length-of-stay "guesses" that relate to the achievement of the expected level of success. The plan is reviewed periodically by both clients and therapists on a formal basis during the course of treatment.

All of the completed forms were pilot tested before being sent out for final layouts and printing. Formal implementation of the new record system was staggered. The data base forms were used for 4 months, and then the treatment plan was implemented. Feedback and extensive monitoring of the data were essential components of the final training. The process of automating the record occurred only after the new system was fully tested manually for approximately 6 months.

HARDWARE SYSTEM

The hardware configuration includes a Qantel Series 1400 system with 88K, 30 megabytes of disk storage, three CRTs, and a 300-line/min printer. A 1600 BPI tape drive is used for backup, archiving, and communicating with the state's IBM system and the hospital's Honeywell system.

The system supports multiple jobs by dedicating separate partitions of memory for each terminal. The Qantel line of computers is modular. The software thus can run without modifications on either larger or smaller Qantel hardware configurations, depending upon the size of an agency's operations. Qantel's version of BASIC was used for all programming.

SOFTWARE SYSTEM

A description of the file structure and some of the reports available is provided below as a means of describing the scope of the system.

File Structure

The system is set up with a separate file for each of the data entry documents described below.

Preliminary screening. Information in this file is captured by a clinical staff person at the point of first contact with a client (usually a telephone call). Data in this file include the time and date of the contact, client name, address, telephone number, sex, race, birth date, service eligibility, referral source, and disposition of the contact (scheduled evaluation or indication to whom the client was referred). In the event that a decision is made to see the client, information is also captured about previous mental health/psychiatric treatment, presenting problems (with a severity rating for each problem), the client's suicide potential, the client's potential danger to others, rated priority of need for service, and scheduling of the appointment made for the client.

Demographic information. As part of the registration process, the clerical staff captures information on

ethnicity, living arrangements, citizenship, education, occupation, employment, and relatives who have received treatment.

Financial information. The clerical staff captures information on income, number of dependents, occupants of the household, sources of third-party payment, and other financial information needed for billing.

Clinical intake. Information in this file is supplied by the clinical staff at the time of the initial evaluation. The data elements include who does the evaluation, where it is done, which other community agencies are involved with the client, what recent stresses the client has experienced (along with the clinicians' rating of how well the client is coping with each stressor), what the presenting problems are, problem severity ratings, information on the duration of each problem, diagnosis, ratings on potential suicide and danger to others, level-of-functioning ratings (Carter & Newman, 1976), medical problems, current medications, allergies to medications, whom to contact in an emergency, and the disposition of the case (treatment or referral out). In addition, data are also captured on what are convenient times for future appointments and what consent forms the client has signed. Future listings of these consent forms are used to trigger a variety of activities, such as pre- and posttreatment outcome assessment of clients and clients' significant others, requests for discharge summaries from other previous service providers, and so on.

Time of first treatment. The information in this file is supplied by the primary therapist (case manager) at the time of the first treatment session. Data elements include therapist's name and program, date of first session, what resources (strengths) the client has, presenting problems, problem severity and history, diagnosis, level-of-functioning rating, and ratings of suicide and danger potentials. In addition, this file contains pretreatment scores of the SCL-90 (Derogatis, Lipman, Rickels, Uhlerhath, & Covi, 1974) and the PARS scales (Ellsworth, 1975), which are used for our multisource outcome assessment program (Sherman, Note 2).

Treatment plan. This file contains information on what problems are being treated, what client resources are being incorporated into the treatment plan, what the goals and objectives are for the treatment of this problem, what the guessed time frames for goal attainment are, what intervention is being used to achieve these objectives, and what the rationale underlying the choice of treatment modality vis-à-vis goals and problems is. In addition, this file contains updates on problem severity and goal attainment, supplied at the time of formal treatment reviews.

Medical treatment plan and records. The information in this file is supplied by the psychiatrist. Initial information includes what other medications the client is taking, what allergies the client has, and what the

problem(s) and specific symptoms that will be treated are. In addition, this file contains a record for every prescription given to the client at the CMHC.

Discontinuation. Data in this file are supplied by the primary therapist at the point that treatment is discontinued. Data elements in this file include the reason for discontinuing treatment (or for transferring the client to another program within the agency), external referrals, closing diagnoses, level-of-functioning ratings, and SCL-90 and PARS posttreatment scores.

Service history and billing. This file is a transaction file that includes the following information for each entry: service recipient identifier, date of transaction, program unit providing service, type of service, an activity code, amount of time involved, level-of-functioning rating, service provider, and the net and gross fees for the service. A field is also included to indicate group contacts. The net and gross fees are computer generated via table look-ups based on parameters such as client liability, income, number of dependents, and type of service, most of which the computer automatically retrieves from data files. The same file contains transaction histories for all (consultation and education) agencies that the center interacts with.

These, then, are the major system inputs and data files. A large variety of other data files are also needed to support the entire system. These include files for accounts receivable, agency registration, staff payroll information, monthly and yearly pointer files, and so on.

Reports

Some of the programmed reports available are described, along with the intended primary user and the types of decisions the information is designed to impact.

Client listing. This report is produced monthly and distributed to each staff person carrying a clinical case load. The report lists each client who was an open case as of the start of the reporting month. Information for each client is provided on the latest admission date, the program that has clinical responsibility, the number of direct (face-to-face) service contacts in the month, entry and most recent level-of-functioning ratings, the type of service last provided, the total number of service events provided in the episode of care (both direct and indirect), an asterisk if the client has not been seen in 45 days, and a confirmation of any changes made to the client's status during the month. The information contained in this report is intended to help clinicians manage their case loads and distribute the resource of their own time. This report also shows the resources that other staff in the agency are committing to each client. In an ideal setting, the presence of such information would be redundant, but in large agencies having many separate programs, staff members often are unaware of all the services being provided to a client. By displaying information on resources consumed along with global measures of client change (entry and most

recent levels of functioning), we call attention to issues that have to do with cost-effectiveness and, more generally, resource allocation.

Staff activity report for clinical staff. A monthly report is distributed to each person in the agency showing (in terms of both hours and events) how staff members are deploying their time. This report also shows the allocation of staff time by program. Data for each staff member are displayed by program, type of service, and activity code. Activity codes are used to indicate cancellation and failure rates, as well as a variety of other information.

Staff activity reports for program directors. This report is distributed on a monthly basis to program directors. The report shows how staff time is being deployed by program, type of service, and staff. This report is useful for determining if and where actual resource allocation is deviating from expected allocation. A program manager is able to monitor this issue down to the level, for example, of whether an individual staff person is providing the agreed upon amount of agency consultation.

Census. A census report is produced monthly, showing the movement of clients into, out of, and between programs within the agency. Information presented includes number of new cases seen during the reporting period, number of cases closed at intake, number of cases transferred in or out, number of cases that were active during the month, and the census as of the end of the month. In addition to the obvious utility for monitoring client flow patterns, this report also enables program directors and supervisors to monitor the percentage of the program's case load that is inactive each month. If this percentage is too high, supervisory staff can use the client listing report to determine how inactive cases are distributed across therapy staff.

Management report. This monthly report is distributed to the entire management team and the advisory board. The report provides the most condensed version of what happened within each program in terms of a variety of key performance indicators. Information is provided for each program in the agency showing staff hours, client hours, client contacts, number of clients served, and number of bills generated. This information is broken down by three major categories: direct service to clients, indirect service to clients, and service to agencies. Variances between the actual and projected amounts of service are provided to facilitate management's monitoring process.

Discontinuation register. This monthly report provides each individual clinical staff member and his or her clinical supervisors with information on clients whose services were discontinued during the reporting month. Information on length of stay (number of weeks, as well as number of direct service sessions) and treatment outcome (changes in level of functioning) is provided, along with diagnostic information. Once again, the intent is to present a combination of information

addressing the issue of what resources were consumed with what results.

Client demographics. Reports on selected client demographics are produced on a quarterly basis. A variety of information on age, sex, ethnicity, third-party liability, type of residence, primary problem presented, education, and so on, is summarized for each program. Actually, two separate reports are produced for each program: one summarizing this information for cases closed at intake and another presenting the same information on cases accepted for treatment. This information is useful for doing program profile analyses, for monitoring in a gross way how accessible the clinic is, and for general planning about service provision. These reports can be produced for identified patients only (case count) or for all registered cases (each family member is included, in addition to the identified patient).

In total, there are some 30 formatted (programmed) reports having to do with some aspect of clinical service. These reports range in content from prompts to each clinician on what clients will require service reviews and what treatment plans are due and missing to drug profiles by client diagnosis or presenting problems and cost-outcome matrices for comparing cost-effectiveness across modalities, staff members, or client characteristics.

Administrative reports. A series of administrative management reports is available showing net and gross billables by program and type of service, age of accounts receivable, and so on. These reports provide information critical for financial management.

Report Generator

In addition to the programmed reports, the entire file structure can be assessed using an interactive report generator supplied by Qantel. The report generator can access multiple files and is invaluable in terms of enabling us to provide customized reports on a timely basis. One of its greatest uses is in providing data to the center's quality assurance subcommittees. Listings of clients meeting an infinite variety of selection criteria are easily attainable at no additional programming costs to the agency. Staff members are also encouraged to make requests for custom reports, which are generally produced within 1 week of the initial request. We would have difficulty justifying production of some reports if the cost were not so negligible. For example, what agency would be willing to supply a child therapist with a listing of clients sorted by birth date so that the therapist is able to send birthday greetings? We go out of our way to produce reports similar to this because we know the reinforcement value (benefits) by far exceeds the costs. The report generator is also an extremely powerful tool for debugging programmed reports.

Statistical Package

While report generators are useful for selecting and

listing cases meeting a specified set of criteria, they are generally inadequate for providing useful aggregated data. For this reason, a set of statistical routines was designed as part of the system. The routines include cross-tabulations, a variety of descriptive statistical summaries, a half-dozen of the more frequently used measures of association, multiple regression, and a variety of inferential statistics. In addition, routines are available for grouping variables, data transformations, and other similar data manipulations.

LESSONS LEARNED AND FUTURE DIRECTIONS

Lessons Learned

Most aspects of the Ravenswood system have been operating for more than 2 years, but the process of systems documentation is still going on. One major lesson we have learned is that the time required to successfully design and implement such a system is on the order of 2-3 years. Successful implementation is operationally defined here as our having evidence that the output of the system improves the functioning of the organization. In mental health settings, the criteria for assessing the functioning of the organization must relate to the quality of care being provided and the cost-efficiency with which it is provided. The majority of the resources required for successful implementation will be consumed in staff training and management training, not in programming. For this reason, it may be unrealistic to assume that transporting a mental health software package in toto (or with minor modifications) is going to drastically reduce the timetable. The presence of computer outputs (data) does not spontaneously result in the incorporation of those data into the process of decision making. It takes trained personnel to utilize information for managing. Most program-level mental health managers have not been exposed to this training in their clinical graduate programs.

A second lesson we have learned is that the computer will be scapegoated as an expression of clinical staff resistance. The real object focus of the resistance is probably the centralization of power and the concomitant loss of autonomy that are natural by-products of accountability. Management concerns about cost-effectiveness and quality of care translate into policies and procedures that delimit clinicians' autonomy about deciding what is appropriate treatment. Resistance to computers should be interpreted as resistance to management's readiness and willingness to proactively manage their organizations.

Successful implementation, in turn, is dependent upon management's readiness to actively manage the organization. Management must be willing to adopt the philosophy that if something does not show up on a computer report (or is not documented in some other acceptable fashion), it did not happen. Contingencies must be designed to ensure that everyone in the organi-

zation understands the message. If management does not adopt such a stance, information systems will be predictably sabotaged by staff members who argue that the information is inaccurate (because they did not turn in a log, open or close a case, etc.). Management's choice at that point is to ignore the data as a basis for decision making (thereby reinforcing staff behavior) or to adopt a strategy with appropriate contingencies for ensuring useful information.

A final lesson worth mentioning is that systems such as the one described can be implemented without decimating an organization and that the time and expense involved can be justified by its impact on client care.

Future Directions

The current system is satisfying the needs of this agency's clinical staff and management. The presence of the computer system has enabled us to make quantum leaps in the areas of quality assurance, program management, and program evaluation. The system's potential for interventionally relevant research is unbounded. Having a good and readily accessible data base, including information on client characteristics, process variables, treatment outcome, and episode costs, has enabled us to begin to investigate crucial issues such as what treatment, based upon what client characteristics, will provide the best return (outcome) for the resources consumed (Sherman & Smith, Note 3, Note 4).

Such issues are difficult to answer, even given the data and automated processing. An obvious benefit of our computer system is that we are at least addressing the issue—thanks, in part, to not having to do a lot of work that the computer now handles routinely.

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